The Role of Environmental Consciousness in Transport Model Choice and Economic Growth

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In recent years, environmental issues are increasingly discussed in the context of sustainable development. The background of motivation for conserving the natural environment is considered due to the change in environmental consciousness of individuals and governments from the late 1960s. Fully understanding on the issues about the environmental consciousness is becoming increasing important as general environmental concerns are making their ways into main public policy agenda to achieve the sustainable development for both aspects of the environment and economy. Encouraged by this background, this dissertation therefore empirically studies the role of environmental consciousness in transport modal choice and economic growth, which tries to give some evidences to support the hypotheses that increasing environmental consciousness brings pro-environmental behavior at individual level and decrease pollution at aggregate level.

The dissertation is composed of six chapters. Chapter 1 introduces the research problems of this study and gives an overview on the study. Chapter 2 provides a detail review on Stated Choice Method (SCM) which is applied in both Chapter 3 and Chapter 4, paying particular attentions on its theoretical background, application, empirical models, experimental design, and procedure to implement. This review suggests that comparing to other stated preference (SP) methods, SCM has a major advantage that it meets the objective of a stated preference analysis to simulate actual consumer behavior by allowing simultaneous evaluations of a number of alternatives or a choice between alternatives. Some advanced models based on the degrees of relaxation of the Independently and Identically Distributed (IID) assumption on error terms are introduced. More complex model seems to be more plausible than relatively simple specifications.

Chapter 3 investigates whether individual environmental consciousness is one of the determinants in transport modal choice. In this chapter, a transport's negative impact on the environment is modeled as one of the attributes of each mode. By this modeling, it is able to examine whether individual environmental consciousness has a significant effect on his/her choice of transport mode. A survey date from Saito and
Onohara Area in Northern Osaka of Japan is used to estimate the model specified by Heteroscedastic Extreme Value (HEV). Both of the estimated and simulated results imply that individual environmental consciousness does influence his/her decision on transport modal choice.

Chapter 4 investigates the impacts of local natural environment and transport network accessibility on individual transport modal choice. By using a stated choice survey data from Eastern Osaka of Japan, the estimated results of a modified HEV specification significantly suggest that in the case of either local natural environment being worse than current or transport network accessibility getting improved, respondents show a higher probability to choose public transport modes (monorail and bus) other than private car. In addition, the estimated results by sub-sample data are consistent with full-sample result, which supports the results of the whole sample estimation.

Chapter 5 deals with the issue on interaction between pollutant emissions and economic growth, based on the assumption that economic growth leads to higher environmental consciousness and therefore more demand on high quality of the environment. In this chapter, Chinese provincial data from 1993 to 2002 is used to examine the existence of Environmental Kuznets Curve (EKC) relationship between per capita income and per capita pollutant emission. Acknowledged by the theoretical framework that economic growth and pollution are jointly determined, this chapter starts from formulating a simultaneous equations model to investigate the relationship between per capita income and per capita pollutant emission. A Hausman test is applied for income exogeneity and a two-stage least squares (2SLS) method is used to estimate the simultaneous equations model. There are significant differences found between single polynomial equation estimators that are commonly used in EKC literatures and simultaneous equations estimators. As a result, since these differences tend to causing different policy implications, therefore, this chapter suggests that the simultaneity between income and pollution should be considered before regressing the model in future EKC studies. In addition, this chapter also empirically investigates the impact of pollutant emissions on economic growth and the determinants of government pollution abatement expense. Both negative effects of pollution on income and of pollution abatement expense on emissions suggest that pollution obstructs economic growth in China, therefore in order to achieve a sustainable growth, more pollution abatement expense should be invested.

Finally, Chapter 6 summarizes the relevant conclusions of this research and states some policy implications and suggestions for future research.

論文審査の結果の要旨

本博士請求論文は、環境問題の深刻化によって発展の持続可能性が問われる中、人々の環境意識の向上が各々の選択行動の変化を通じて、汚染の減少や環境配慮行動にどのような結果をたらすかを実証的に明らかにしようとしたものである。取り上げられた主な課題は二つである。一つは、ミクロ的な選択の選択分析を通じて、人々の環境意識の変化がどのような効果をもたらすかを数量分析している。もう一つは、中国のマクロ経済成長において、汚染排出とそれを緩和しようとする支出の相互作用を解析し、汚染防止支出の重要性を明らかにした。本論文は全体で6章から構成されている。

まず、第1章は、論文全体の背景、目的、構成についてのイントロダクションである。第2章は、第3章と第4章で使われるStated Choice Methodに関する細密なサーベイ論文で、分析道具の特性が検討されて、サーベイデザイ

ンが用意されている。

第3章は、北海道（帯野と小野原地域）で実施されたアンケート調査法を用いた交通手段（モノレール、バス、自

動車）の選択実験で、加害者としての個人の環境意識が交通手段選択に与える効果を分析している。Heteroscedastic Extreme Valueモデルを用いた推定結果によると、環境への負荷の大きい交通手段ほど選択確率が低くなり、負荷の

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少ない交通手段へシフトするという結論を得た。

第4章は、都市環境が比較的劣悪な東大阪で行われた同様の交通手段の選択実験で、被害者としての環境意識の悪化と交通ネットワークの改善が、手段選択に及ぼす影響を実証分析したものである。自然環境意識の悪化は公共交通機関（モノレールとバス）の選択確率を38.173％も増加させるが、公共交通ネットワークの改善は環境悪化に比較してその効果が弱いことも分かった。

第5章は、中国における1993年から2002年までの省別のデータを用いて、所得と汚染排出が反方向に及ぼす影響について、同時方程式を用いて分析することにより、環境クズネッツ曲線の論争に新しい分析視点を導入した。推定結果によると、汚染排出の所得への負の影響（0.64％〜3.06％）が検出され、中国の持続可能な発展のために、汚染防止への投資の重要性が数値的に明らかにされた。

第6章では、以上の結論を取りまとめ、政策提言と今後の研究課題が論じられている。

本論文は、費用便益分析への途上であることや、サンプルやデータに限定性はあるものの、環境意識の交通手段選択に及ぼす効果がはじめて数値的に明らかにされ、環境クズネッツ曲線の論争に新しい見解が持ち込まれるなど、非常に高いレベルの実証研究と評価された。よって、審査委員会は提出された論文を一致して、博士（国際公共政策）の学位を授与するに値すると認定した。